CHAPTER 4
FACILITY REQUIREMENTS
MASTER PLAN UPDATE

Nogales International Airport
Santa Cruz County

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CHAPTER 4 FACILITY REQUIREMENTS

Airports perform a wide variety of functions including facilitating the movement of goods and people between air and ground. Consequently, the challenges for airports are processing goods and people and accommodating the various demands on its facilities in a safe, efficient, and cost-effective manner. Therefore, a fundamental part of effective airport planning is identifying the facility requirements that will provide airports with the processing and physical capacities to accommodate the various projected demands.

Identifying the facility requirements for Nogales International Airport begins with measuring the ability of the existing facilities to accommodate forecast demand levels over the short term (5 years), medium term (10 years), and long term (20 years) of the planning window. Capacity shortfalls and deficiencies, which include meeting FAA airport design standards and improving facilities in less than adequate condition, are then translated to airport development needs for the airside and landside components of the airport. Once the facility requirements have been identified, the master planning process proceeds to the alternatives element (chapter 5), where development alternatives of the airport needs are evaluated and a preferred alternative is selected.

4.1 AIRSIDE

4.1.1 Runway

Runway 3-21 is the only runway at Nogales International Airport. The runway's operational capacity and geometry define the runway requirements for the airport. Operational capacity refers to the ability of the runway to accommodate aircraft operations demand. The runway must also meet FAA geometric design standards, which are guidelines to ensure the safety, economy, efficiency, and longevity of an airport.

DEMAND AND CAPACITY

For the purpose of the Master Plan Update, the Airport Capacity and Delay for Long Range Planning component of the FAA's computer program, *Airport Design Version 4.2D* was used for the demand/capacity analysis. For this model, touch-and-go operations are estimated at nine percent of total operations. The runway operational capacity is measured at three levels: annual service volume, hourly capacity, and delay.

- Annual Service Volume (ASV)

  Annual service volume refers to the estimated number of aircraft operations the runway can accommodate over a year's time, taking into account operating conditions that would be encountered.

  Runway 3-21's annual service volume is estimated at 230,000 operations throughout the planning period (**Table 4-1**). The ratio of annual demand to ASV or percent capacity ranged from 12 percent to 22 percent with the highest percent capacity projected for the year 2020 when almost 50,000 operations are forecast. Capacity improvements should

be considered once demand reaches 60 percent of the ASV as per FAA Order 5090.3B. Hence, Runway 3-21 is adequate to accommodate forecast annual operations demand throughout the planning period.

TABLE 4-1 ANNUAL SERVICE VOLUME

Year	Aircraft Operation Demand	Annual Service Volume	Percent of ASV
1999	27,754	230,000	12%
2005	32,728	230,000	14%
2010	37,603	230,000	17%
2020	49,820	230,000	22%

FAA's *Airport Design Version 4.2D* was used to calculate ASV

- Hourly Capacity

Hourly capacity for the runway measures the number of aircraft operations the runway can accommodate within a hour time under specific flight rules. Meteorological conditions dictate which flight rules apply.

Weather, in reference to airports, is expressed in terms of visual or instrument meteorological conditions. Visual meteorological conditions refer to a cloud base of 1,000 feet above ground level or greater and visibility of three statute miles or greater. Instrument meteorological conditions refer to weather conditions below visual meteorological conditions. Visual flight rules (VFR) apply to the former, which is referred to as VFR weather, and instrument flight rules (IFR) apply to the latter and is referred to as IFR weather.

Nogales International Airport experiences VFR weather 98 percent of the time. During the two percent of the time IFR weather occurs, it usually clears by the afternoon, hardly lasting throughout a full day and therefor Nogales International Airport provides VFR flying for essentially every day of the year.

The hourly capacity for Runway 3-21 under VFR and IFR is 98 and 59 aircraft operations, respectively, throughout the planning period (**Table 4-2**). As shown, forecast demand will not exceed the capacity of the runway to accommodate aircraft operations on a hourly basis under any weather condition. Under VFR, percent capacity ranged from 14 percent to 26 percent, with the highest level estimated for the year 2020 when peak hour demand is projected at 25 aircraft operations. Similarly, the highest percent capacity at 42 percent is estimated for the end of the planning period under IFR conditions.

TABLE 4-2 HOURLY CAPACITY

Year	Peak Hour Demand	Hourly Capacity		Percent Capacity
		VFR	IFR	
1999	14	98	59	14%-24%
2005	16	98	59	16%-27%
2010	19	98	59	19%-32%
2020	25	98	59	26%-42%

FAA's *Airport Design Version 4.2D* was used to calculate hourly capacity

→ Delay

As the number of aircraft operations approaches capacity, increasing delay occurs. For planning purposes, delay is measured as minutes of average delay per aircraft and annual delay as calculated by the FAA's Airport Design computer program. For Runway 3-21, projected delay is not expected to exceed an average of 0.1 minute per aircraft or 83 hours annual delay. Generally, capacity improvements are considered when the average delay per aircraft reaches four minutes.

GEOMETRIC LAYOUT

The layout of an airport is designed not only to best accommodate the functions of the airport, but also to do so in a safe, efficient, and cost-effective manner. Ensuring the latter, are the FAA's design standards. The standards provide guidelines that define runway critical surfaces, separation standards, and runway dimensions. Equally important is the runway orientation, which is primarily based on wind coverage.

→ Geometric Design Standards

The airport reference code (ARC), which is a two part coding system, interprets the design standards for operating and developing an airport. The first part is the aircraft approach category, which refers to the aircraft approach speed. The airplane design group, which refers to the airplane's wingspan, makes up the second part to the ARC. Together, the aircraft approach category and airplane design group tie in the airport design standards with the operational and physical characteristics of the most demanding aircraft or family of aircraft predominantly operating at the airport. A threshold of 500 or more annual operations is used in determining whether the design aircraft utilizes the airport on a regular basis. **Table 4-3** lists the different aircraft approach categories and airplane design groups.

TABLE 4-3 AIRPORT REFERENCE CODE

Aircraft Approach Categories		Airplane Design Groups	
Category	**Speed**	**Group**	**Wingspan**
A	Less than 91 knots.	I	Up to but not including 49 feet
B	91 knots or more but less than 121 knots.	II	49 feet up to but not including 79 feet
C	121 knots or more but less than 141 knots	III	79 feet up to but not including 118 feet
D	141 knots or more but less than 166 knots	IV	118 feet up to but not including 171 feet
E	166 knots or more	V	171 feet up to but not including 214 feet
		VI	214 feet up to but not including 262 feet

Source: FAA AC 150/5300-13 Airport Design

Nogales International Airport only has two Category D type aircraft utilizing the airport (**Table 4-4**). They are the Gulfstream IV and Lear 35 aircraft, which are operated by general aviation corporate/private users. Combined, the aircraft account for 151 and 299 annual operations for 1999 and 2020, respectively. The levels fall short of the 500 annual operations threshold in order for the airport to be upgraded to a Category D from the Category B designation in the previous master plan. However, Category C aircraft account for almost 1,300 operations in 1999 and 1,800 in 2020, well beyond the 500 threshold. Therefore the first part of the airport reference code for Nogales International Airport should be upgraded to a Category C.

TABLE 4-4 AIRCRAFT APPROACH CATEGORY

Aircraft	Operator	Annual Ops. 1999	Annual Ops. 2020
Category D: Speed 141 knots or more but less than 166 knots.			
Gulfstream IV	Corporate/Private	76	152
Lear 35	Corporate/Private	75	147
Subtotal		151	299
Category C: Speed 121 knots or more but less than 141 knots.			
C12 (Super King Air 300)	Military	824	914
Beechcraft 350	Customs	35	39
Canadair 600 Challenger	Misc. Charters	30	50
Lear 23,25,25	Misc. Cargo Haulers	85	176
Lockheed C-130	Linden Air Charter	24	49
Cessna 750 Citation X	Corporate/Private	145	268
Gulfstream V	Corporate/Private	76	151
Lear 60 Longhorn	Corporate/Private	74	143
Subtotal		1,293	1,790
Total		1,444	2,089

Source: *FAA AC 150/5300, Airport Design.*
Tiffin Aviation, 2000.

Only 24 and 49 annual operations in 1999 and 2020, respectively, can be attributed to the Lockheed C-130 airplane, the only Group IV airplane operating at Nogales International Airport (**Table 4-5**). Linden Air Charter operates the C-130 airplane. Group III airplanes at the airport include the Convair and DC-3 airplanes, which are operated by miscellaneous cargo haulers. They totaled 67 operations in 1999 and 138 in 2020. However, in early 2002 as this Master Plan reached its final publication stage, the FBO noted that one cargo hauler used a Boeing 737 for 52 cargo flights (102 operations) on a trial basis. No plans have been identified by the cargo hauler to integrate the Boeing 737 into their cargo operations on a permanent basis. Nevertheless, these activity levels levels do not reach the threshold of 500 annual operations. Even combining Groups III and IV, which can be applied to determine the design airplane utilizing the airport on a regular basis, annual operations do not reach the threshold. Therefore, Nogales International Airport should continue to be designated a Group II airport.

TABLE 4-5 AIRPLANE DESIGN GROUP

Airplane	Operator	Annual Ops. 1999	Annual Ops. 2020
Group IV: Wingspan between 118 feet up to but not including 171 feet.			
Lockheed C-130	Linden Air Charter	24	49
Group III: Wingspan between 79 feet up to but not including 118 feet.			
Convair	Misc. Cargo Hauler	45	93
DC-3	Misc. Cargo Hauler	22	45
Subtotal		67	138
Total		91	187

Source: *FAA AC 150/5300, Airport Design.*
Tiffin Aviation, 2000.

Consequently, Nogales International Airport is an ARC C-II airport based on the aircraft utilizing the airport on a regular basis. While this dictates that the airport be developed to the associated C-II design standards in this 20-year period, it does not mean that the airport will not require an upgrade to C-III standards thereafter when C-III operations do exceed 500 annual operations. In other words, the airport may begin serving aircraft that require greater pavement widths than aircraft served up to the year 2020. It is important to consider this issue when developing facilities to ensure that an upgrade to another set of design standards is not precluded, limited, or too costly.

- Runway Critical Surfaces

The runway critical surfaces consist of the runway safety area, obstacle free zone, object free area, and the runway protection zone. Each varies in dimension and purpose; however, all serve to enhance safety in the operations of the airport. The surfaces are defined by the airport reference code and visibility minimums associated with the airport's approach procedures. As indicated previously, Nogales International Airport has non-precision approaches published into each runway end with visibility minimums not lower than 1 ¼ statute mile.

Runway Safety Area (RSA)

The RSA for Runway 3-21 measures 500 feet wide and 1,000 feet beyond the runway ends per the C-II airport designation (**Table 4-6**). The standards call for the RSA to be able to support an airplane in case of an undershoot, overshoot, or excursion from the runway with minimal risk of damage. It includes maximum grade change of zero to negative three percent for the first 200 feet off the runway end and negative five percent the remainder of safety area.

It is estimated that the safety area off of Runway 3 does not meet the proper grading in accordance with FAA design standards. The terrain begins to drop-off significantly approximately 150 feet off the runway end. The drop in grade exceeds the maximum allowable. Therefore the airport needs to take the necessary steps to bring the safety

area off of Runway 3 within standards. Runway 21's safety area should be upgraded from its current B-II dimensions to accommodate the new C-II dimensions.

TABLE 4-6 RUNWAY CRITICAL SURFACES

Surfaces	Width (ft.)	Length Beyond Runway End (ft.)
Runway Safety Area	500	1,000
Runway Obstacle Free Zone	400	200
Runway Object Free Area	800	1,000

Source: *FAA AC 150/5300, Airport Design*

Obstacle Free Zone (OFZ)

The runway OFZ extends 200 feet beyond the runway ends and its width is 400 feet wide for Runway 3-21. It provides clearance protection for aircraft using the runway by precluding object penetration. Only frangible instruments aiding in aircraft navigation can be located within the OFZ due to their functions. Other components to the OFZ are the inner-approach and inner-transitional OFZ. These are only applicable to runways with an approach lighting system, which Nogales International Airport does not have.

The runway OFZ for Runway 3-21 is free of object penetration, and therefore meets the design criteria.

Object Free Area (OFA)

The runway OFA enhances safety of aircraft operations by keeping the designated area clear of above ground objects. Similar to the OFZ, only frangible objects necessary for air navigation and ground maneuvering are permitted within the OFA. The OFA for Runway 3-21 measures 800 feet wide and 1,000 feet beyond the runway ends, and is clear of any nonessential object penetration meeting the design criteria.

Runway Protection Zone (RPZ)

The runway RPZ serves to protect people and property off the runway ends. It is trapezoidal in shape and centered along the extended runway centerline beginning 200 feet beyond the runway end. The RPZ configuration for Runway 3-21 is 500 feet inner width, 1,010 feet outer width, and 1,700 feet in length. The RPZ function is facilitated by the airport controlling and maintaining the area clear of incompatible objects and activities. Although it is not required, it is preferred the airport control the area through ownership.

The RPZ for Runway 3-21 at Nogales International Airport consist of open terrain and free of any prohibited land uses and activities such as residences and places of public assembly. Therefore, the runway RPZ meets design criteria.

✈ Runway Separation Standards

Separation standards provide an added tool to ensure an aircraft operating away from the runway do not penetrate the runway safety area or obstacle free zone. The standards define separation distances from the runway centerline to other aircraft facilities on the airport, such as taxiways and aircraft parking area. The airport's ARC designation and the approach visibility minimums interpret the separation distances.

Table 4-7 presents the runway separation standards for Runway 3-21 at Nogales International Airport. The aircraft parking area and parallel taxiway A exceed the minimum separation requirement. However, the holdlines are positioned closer to the runway centerline than the standard requires. Therefore, the holdlines need to be relocated further back at 250 feet from the runway centerline.

TABLE 4-7 RUNWAY SEPARATION STANDARDS

Runway Centerline to:	Separation Requirement (ft.)	Existing Separation Distance (ft.)
Taxiway Centerline	300	381
Holdlines	250	125
Aircraft Parking Area	400	481

Source: *FAA AC 150/5300-13, Airport Design*
FAA AC 150/5340-1G Standards for Airport Markings

✈ Runway Dimensions

The wide variety of existing airplanes requires a wide range of runway dimensions under different elevation and climate conditions. The recommended dimensions of the airport's runway should be based on the family of airplanes forecast to use the runway on a regular basis. A specific airplane needing the longest runway can also be used for determining the appropriate length for the runway. Equally important are the elevation and climate conditions since they have an effect on aircraft performance. For instance, high elevations and hot temperatures equate to low air density, and consequently reduced aircraft performance.

Runway Length

The FAA's *Airport Design* computer program was used for the preliminary analysis of the recommended runway lengths for Nogales International Airport. **Table 4-8** presents the calculated results. Runway 3-21's length of 7,200 feet can accommodate all of the small airplanes of 12,500 pounds or less, which account for almost 91 percent of the total operations at Nogales International Airport. Large airplanes of more than 60,000 pounds with a haul length of nearly 836 miles can be accommodated with the existing runway length. The haul length covers destination cities such as Austin, Dallas, Denver, and Salt Lake City. Large airplanes more than 60,000 pounds account for less than one percent of the annual operations.

However, large airplanes, which are 60,000 pounds or less, would be weight-restricted when operating out of Nogales International Airport according to the computer program results. The results call for a runway length of 7,420 feet to accommodate 75 percent of

these large airplanes at 60 percent useful load. These airplanes conduct over eight percent of the annual operations.

TABLE 4-8 FAA *AIRPORT DESIGN* CALCULATED RUNWAY LENGTHS

Family of Airplanes	Runway Length
Small Airplanes (12,500 lbs. or less)	
Small airplanes with approach speeds of less than 30 knots	420 ft.
Small airplanes with approach speeds of less than 50 knots	1,120 ft.
Small airplanes with less than 10 passenger seats	
• 75% of these small airplanes	4,010 ft.
• 95% of these small airplanes	5,240 ft.
• 100% of these small airplanes	5,580 ft.
Small airplanes with 10 or more passenger seats	5,580 ft.
Large Airplanes (60,000 lbs. or less)	
• 75% of these large airplanes at 60% useful load	7,420 ft.
• 75% of these large airplanes at 90% useful load	9,760 ft.
• 100% of these large airplanes at 60% useful load	9,650 ft.
• 100% of these large airplanes at 90% useful load	11,120 ft.
Large Airplanes (more than 60,000 lbs.)	
Estimated length of haul:	
• 500 miles (covers Phoenix, San Diego, and Los Angeles)	6,400 ft.
• 651 miles (Salt Lake City, UT)	6,770 ft.
• 672 miles (Denver, CO)	6,820 ft.
• 787 miles (Austin, TX)	7,100 ft.
• 836 miles (Dallas, TX)	7,210 ft.
• 1,474 miles (Chicago, IL)	8,640 ft.
• 1,552 miles (Atlanta, GA)	8,810 ft.
• 1,708 miles (Detroit, MI)	9,130 ft.

FAA's *Airport Design Version 4.2D* was used for calculations

Further analysis of the recommended runway length for Nogales International Airport looked at the specific airplanes actually operating at the airport. Nogales International Airport currently has three airplane types with weights of 60,000 pounds or more operating at the airport. They are the Gulfstream IV and V and the Lockheed C-130 airplane. According to the aircraft outlook and specification published in the *Aviation Week & Space Technology Source Book*, the FAA takeoff field length for these airplanes are 5,450, 5,990, and 6,000 feet, respectively. It should be noted that in early 2002 as this Master Plan neared final publication, the FBO reported that one cargo operator used a Boeing 737 for cargo flights on a trial basis. No plans have been identified by the cargo hauler to integrate the Boeing 737 into their cargo operations on a permanent basis and thus, this has no impact on the current forecasts and facility requirements identified. If this changes in the long-term, the runway takeoff length requirement could range from

6,000 to the full 7,200 feet available at Nogales depending on factors such as density altitude, haul length, and takeoff weights. Takeoff weights closer to maximum gross takeoff weight would require runway lengths in excess of 9,000 feet.

Samples of the large airplanes, which are 60,000 pounds or less, include the Falcon 900 and 2000, Citation X, Lear 60 and 35, and Embraer 120. The FAA takeoff field length for these airplanes vary, but all are less than 6,000 feet, well within the existing 7,200 feet allowable takeoff length for Runway 3-21 at Nogales International Airport.

Consequently, it appears Runway 3-21 can accommodate the airplane types actually using the airport, and projections indicate the same family of airplanes will continue to use the runway on a regular basis. Therefore, the current runway length of 7,200 appears adequate for the planning period.

Runway Width

The airport's ARC C-II designation calls for a runway width of 100 feet according to the FAA *AC 150/5300-13, Airport Design.* Runway 3-21 at Nogales International Airport is only 90 feet wide with the exception of the recent 1,200-foot extension, which is 100 feet wide. Therefore, the airport needs to widen the remaining 6,000 feet of runway to 100 feet in order to meet runway design standards.

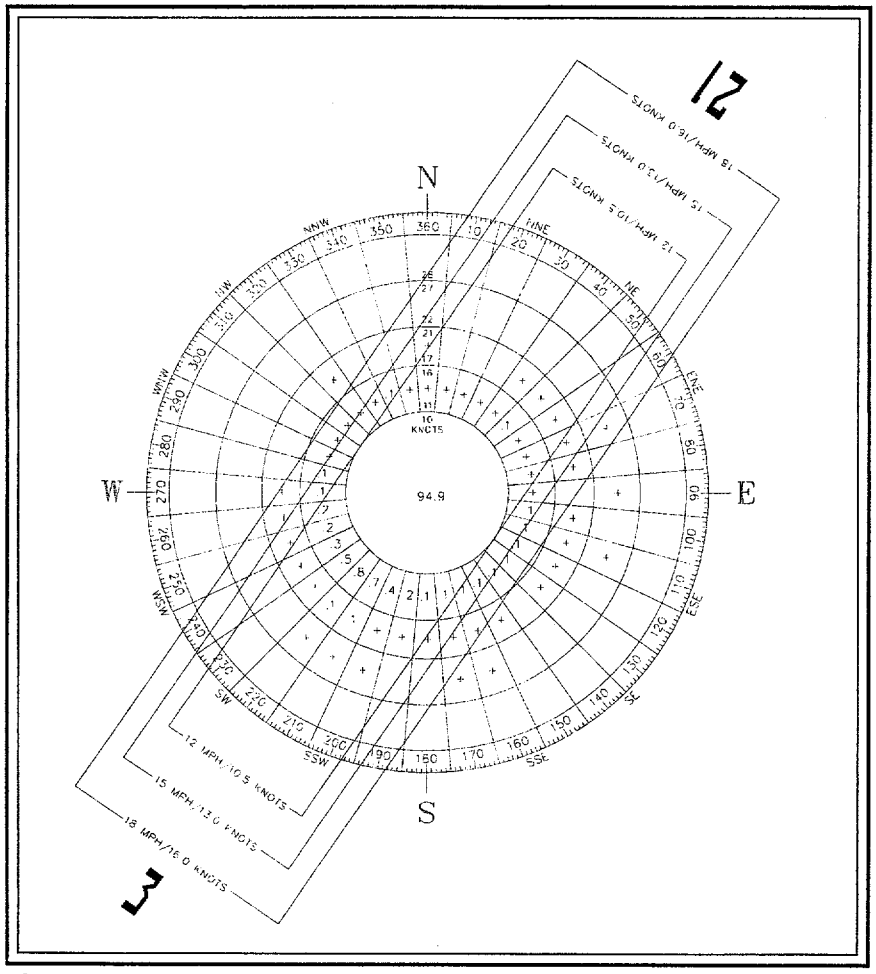
- Runway Orientation

The preferred runway orientation typically is aligned with the prevailing wind. It provides the most wind coverage and minimum crosswind components. For capacity purposes, it allows an airport to remain operational under adverse wind conditions. FAA criteria calls for 95 percent wind coverage based on the total number of weather observations. It takes into account various factors influencing operations and the economics of providing the coverage.

Runway 3-21 at Nogales International Airport is oriented at N 46^0 22' 34" E true bearing with an accompanying magnetic declination of 11 degrees, 19 minutes east. Based on weather observations recorded by the on-site Automated Surface Observation System, Runway 3-21 experiences wind coverage greater than 99 percent for wind speeds between 10.5 and 16 knots (**Figure 4-1**). The 99 percent wind coverage exceeds the FAA criteria. Therefore, a crosswind runway is not needed at Nogales International Airport based on the wind analysis and FAA criteria.

However, winds, especially crosswinds, affect airplanes differently. Crosswinds have a greater affect on the small airplanes (12,500 pounds or less) in particular. Considering the significant presence (91 percent of annual operations) of these types of airplanes at Nogales International Airport, the airport may contemplate the desire for a crosswind runway. Therefore, options for enhancing the safety for the small airplanes during adverse wind conditions will be evaluated during the alternatives element of the master planning process. Consideration will be given to increasing operational tolerance to crosswinds by increasing the runway width to the next higher design group.

FIGURE 4-1 WIND ROSE



Source: NOAA National Climatic Center
Period: January 1, 1989 – December 31, 1998

4.1.2 Heliport

The heliport at Nogales International Airport is 97.5 by 97.5 feet with a 54 by 54 feet touchdown and liftoff area. The takeoff and landing approach is towards the northeast parallel to the runway. The heliport connects to the parallel taxiway by means of a 50-feet wide taxiway. The newly constructed heliport facility meets FAA design standards and is adequate through the planning period.

However, helicopter pilots utilizing the facility have expressed concern over electrical poles located across the landing approach. Although the electrical poles are not an obstruction to the approach surface, the pilots perceive them as obstructions. The airport's electrical plan includes placing electrical lines located on the airport underground. Consequently, this action will remedy the perception of an obstruction associated with the electrical poles as they relate to the heliport.

4.1.3 Taxiway

The taxiway system essentially facilitates the movement of aircraft between the runway and landside facilities. It serves to enhance the operational capacity of the runway and must also meet FAA design standards. **Table 4-9** presents the taxiway dimensional standards for Nogales International Airport based on the airplane design group II.

TABLE 4-9 TAXIWAY DIMENSIONAL STANDARDS

Taxiway Element	Dimension (ft.)
Taxiway Width	35
Taxiway Safety Area Width	79
Taxiway Object Free Area Width	131

Source: *FAA AC 150/5300-13, Airport Design*

As inventoried in the Master Plan Update, the taxiway system for Nogales International Airport consists of a parallel taxiway, six runway exits, and three apron connectors. The runway exits are adequately spaced along the runway providing ample means for aircraft to quickly exit the runway. This enhances the runway's operational capacity. All of the taxiways meet dimensional and separation design standards as per the C-II design aircraft, and are adequate throughout the planning period.

Nogales International Airport does experience air traffic from aircraft requiring larger dimensional standards than the airplane design group II dictates. An example is the Lockheed C-130 aircraft, which is projected to have 49 annual operations by the end of the planning period. However, the volume of traffic from the bigger airplane does not meet the 500 annual operations threshold. Consequently, the airport is not designed to accommodate the bigger airplane. However, it has been implied that these airplanes are having difficulty with the taxiway widths, and that the taxiways are beginning to show structural stress from the larger airplanes. Therefore, the widening of the taxiways highly utilized by the larger airplanes should be considered.

4.1.4 Aircraft Tiedown Spaces

Nogales International Airport currently has 22 aircraft tiedown spaces. The general aviation corporate apron has 14 spaces while the other eight spaces are located at the south ramp area adjacent to the T-hangars. An additional five aircraft parking spaces are available at the north ramp area. The spaces are unmarked to provide flexibility on how the area is used. In other words, the area can also be used for staging cargo shipment, rotorcraft parking, or any other need that may arise. The on-site flight school generally parks its fleet on these spaces during the day for convenience. The cargo apron also provides an additional aircraft parking space, which is usually occupied by Ameriflight.

It is assumed the flight school will continue to park its fleet on the north ramp during hours of operation and the cargo apron requirement will be calculated separately. Therefore, only the 22 aircraft tiedown spaces will be used as a baseline in calculating the requirement for tiedown spaces during the planning period.

In 1999, 12 based aircraft occupied tiedown spaces. The ratio was one of every three aircraft needed tiedown space. Attributing to the ratio was the lack of hangar space availability. All of the hangars were and continue to be occupied. The FBO operator indicates there is a waiting list of over 11 aircraft owners desiring hangar space. However, it is assumed the hangar demand will be more accommodating in calculating tiedown space requirements. Further, actual hangar availability should be considered as the airport is developed, which may indicate a higher requirement for tiedown spaces.

Table 4-10 presents the based aircraft demand for tiedown space. It is drawn from the based aircraft forecast and hangar availability. Due to the value and sophisticated characteristics associated with the jet and multi-engine aircraft, hangar space is highly desired for these types of aircraft. Therefore, the based aircraft demand for tiedown space assumed 100 percent of the jet and multi-engine aircraft forecast would be hangared.

TABLE 4-10 TIEDOWN SPACE REQUIREMENT

Year	Existing Spaces	Based Aircraft Demand[1]	Transient Demand[2]	Total Demand	Requirement
1999	22	12	3	15	7 (surplus)
2005	22	7	3	10	12 (surplus)
2010	22	8	4	12	10 (surplus)
2020	22	10	5	15	7 (surplus)

[1] The higher based aircraft demand for 1999 is due to lack of hangar availability.
[2] Derived from Chapter 3 (Section 3.5.4)
Source Stantec Consulting Inc.

The tiedown spaces at the airport also serve transient air traffic. Therefore, transient demand is factored into the tiedown space requirement. As shown in Table 4-10, a total of five transient tiedowns will be needed in 2020. This means that up to five transient aircraft will require parking during the busiest hour of a typical day in August (peak month for aircraft operations at Nogales).

Based on the assumptions stated above and the relative forecasts, the existing 22 spaces are adequate to accommodate the demand for aircraft tiedown space through the planning period. However, the availability of hangars may raise the demand levels and therefore should be considered as the airport is developed.

4.1.5 Cargo Staging Apron

The cargo apron at the airport is located between the general aviation corporate apron and the hangar apron area. It is 100 by 200 feet (20,000 square feet) and is adequate to accommodate a cargo aircraft and staging equipment as cargo is transferred, which usually takes two hours. The north ramp area is utilized whenever there is a need for more than one cargo staging area at any given time.

The annual cargo operations are projected to double by the end of the planning period from over 2,200 in 1999 to almost 4,700 in 2020 (**Table 4-11**). Consequently, the design hour

demand is also expected to double and the need for additional cargo apron. An additional requirement of 20,000 square feet for cargo staging is projected by the year 2010, which should accommodate the cargo demand for the duration of the planning period.

TABLE 4-11 CARGO APRON REQUIREMENT

Year	Operations		Cargo Apron Area (sf)		
	Annual	Design Hr. Demand[1]	Demand[2]	Existing	Requirement
1999	2,280	1	20,000	20,000	0
2005	2,803	1	20,000	20,000	0
2010	3,329	2	40,000	20,000	20,000
2020	4,696	2	40,000	20,000	20,000

[1] Represents design hour of the operations peaking characteristics.
[2] Based on existing 20,000 square feet per design hour demand.
Source Stantec Consulting Inc.

4.1.6 Airfield Pavement

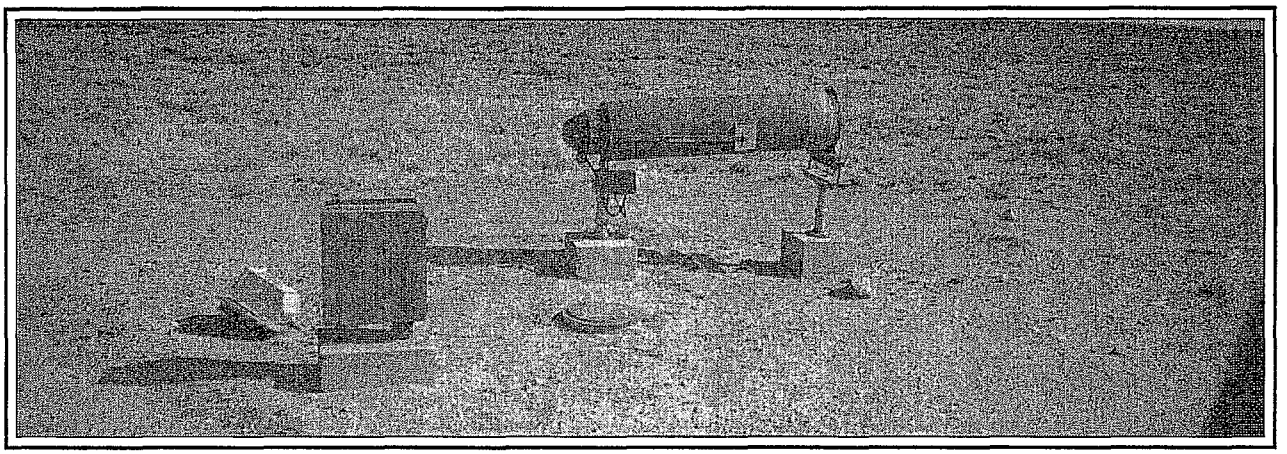
Nogales International Airport currently has in place a Pavement Maintenance Management Program, which calls for periodic pavement preservation projects, usually every five years. The program conforms to the guidelines outlined in the FAA Grant Assurance 11, FAA Program Guidance Letter 95-1, FAA *AC 150/5380-7, Pavement Management System,* and ADOT's *Pavement Inspection Manual.*

Even though Nogales International Airport does experience heavier air traffic weights than the current pavement strength of 30,000 pounds for single wheel and 50,000 pounds for dual wheel, the level represents less than one percent of the total traffic and the same traffic mix is projected for the planning period. Therefore, the current pavement strengths are adequate for the planning period. However, as pavement preservation projects are scheduled, consideration should be made as to whether heavier aircraft activity, such as the C-130 aircraft, are exceeding projections.

4.1.7 Navigational and Visual Aids, Lighting, Marking, and Signage

NAVIGATIONAL AND VISUAL AIDS

The airport's TVOR/DME and NDB provide navigational aid to Nogales International Airport. Visual aid is then provided by the SAVASI and runway end indicator lights (REILs) once the airport is within the pilot's sight. With the exception of the SAVASI, the existing navigational and visual aids are adequate for the planning period. The SAVASI, which is a visual approach slope indicator, is outdated and should be replaced with more current technology.



SAVASI Photograph taken by Stantec Consulting Inc.

LIGHTING

The medium intensity runway lights (MIRL), which provide lighting for the runway, are in good condition. Reflectors are installed at each taxiway and also in good condition. The MIRLs and taxiway reflectors are adequate through the planning period; however, upgrading the reflectors to medium intensity taxiway lights is recommended to enhance safety during aircraft ground maneuvering.

MARKING

Runway 3-21 is marked as a non-precision instrument runway on both runway ends. According to the FAA *AC 150/5340-1G, Standards for Airport Markings,* non-precision instrument marking requires designation, centerline, threshold, and aiming point marking elements. Runway 3-21 is marked according to the FAA standards.

The holdline position markings are addressed under the runway separation standards of section 4.1.1 earlier in this chapter.

AIRFIELD SIGNAGE

Airfield signage is located throughout the airfield. This signage meets current FAA standards and is adequate through the planning period.

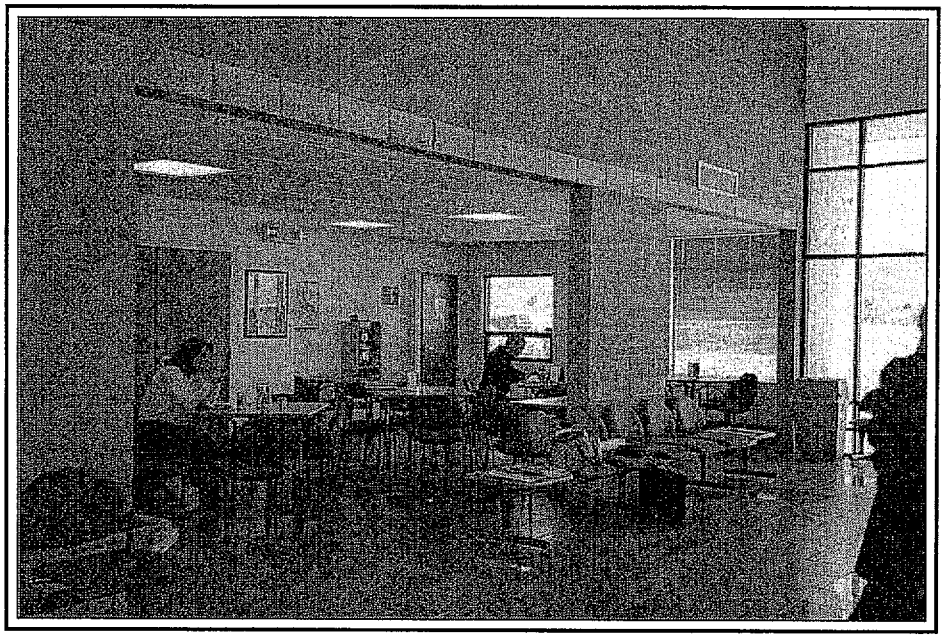
4.1.8 Air Traffic Control Tower

Nogales International Airport does not have an air traffic control tower. According to the Airways Planning Standard Number 1 (APS-1) standard for establishment of a control tower, an airport is eligible for a FAA-supported tower when annual operations reach 200,000. The 2020 forecast of 56,351 annual operations is well below this threshold. A control tower can also be established on a contract basis (private). However, cost and staffing make this an undesirable option for airports similar to Nogales International Airport. Therefore, a control tower is not proposed during the master planning period.

4.2 LANDSIDE

4.2.1 Terminal Facility

A terminal facility in an airport such as Nogales International Airport should provide at a minimum ample circulation space, a waiting room, concession facilities, public telephone and restroom, and administration space. The new terminal building, which houses the FBO, provides all of these services including a pilot lounge. In addition, the facility supports the flight school, aircraft rental and sales, and Federal Inspection Services.



Inside Terminal Facility Photograph taken by Stantec Consulting Inc.

Typically, the airport manager or the FBO operator, as in this case, is in the best position to identify terminal facility needs to accommodate aviation activity. However, for the purpose of the Master Plan Update the general guideline of 150 square feet per itinerant design hour passenger is used to calculate terminal facility requirements. The "passengers" represent everyone who utilize the services found in the terminal, which includes military personnel, Border Patrol and U.S. Customs personnel, cargo traffic pilots, charter pilots and passengers, and both transient and based general aviation pilots and passengers. Therefore, the itinerant design-hour passenger demand for each of these user categories is used in calculating the overall itinerant design hour passenger demand level. The passenger levels are estimated using 1.5 per military, which includes Border Patrol and U.S. Customs, 1 for cargo, 4 for passenger charter, and 1.5 for general aviation (transient and based) demand.

As **Table 4-12** indicates, the terminal can accommodate passengers, pilots, and visitors passing through Nogales International Airport through the year 2005. Thereafter, 164 and 1,514 square feet of additional terminal space will be needed in 2010 and 2020, respectively, to accommodate people using the terminal.

TABLE 4-12 TERMINAL FACILITY REQUIREMENT

Year	Existing Terminal (sf)	Passenger Peak Demand	Terminal Demand (sf)	Facility Requirement (sf)
1999	4,186	22	3,300	886 (surplus)
2005	4,186	25	3,750	436 (surplus)
2010	4,186	29	4,350	164
2020	4,186	38	5,700	1,514

Source: Stantec Consulting Inc.

4.2.2 Auto Parking, Ground Access and Signage

AUTO PARKING

Nogales International Airport has two parking areas for automobiles. One is located in front of the terminal building and the other in front of the general aviation corporate apron area. Both provide 28 parking spaces each.

Terminal auto parking requirements were calculated based on the general guideline of 1.8 parking spaces per itinerant design hour operation. Similar to calculating the terminal building requirements, demand for terminal parking is based on the actual users of the auto parking spaces. However, not everyone using the services in the terminal building requires a parking space. For example, a cargo aircraft pilot may deplane and use the terminal facilities while the cargo is being handled, but will probably not have a need for an auto parking space. Therefore, the calculated demand for auto parking space is limited to military, passenger charter, and transient general aviation traffic. Only transient general aviation is used in calculating terminal parking because additional parking space is provided for the based tenants at another location. The user demand levels were estimated using 4 per passenger charter, 1.5 per transient general aviation, and 1.5 per 50 percent of military operations. It is assumed that only 50 percent of the military traffic require travel into the City of Nogales via automobile. In addition, parking space for the FBO operator and its employees were factored at two to three spaces in the calculations.

As presented in **Table 4-13**, the number of current terminal parking spaces is adequate to accommodate the demand through the planning period.

TABLE 4-13 TERMINAL AUTO PARKING REQUIREMENT

Year	Existing Parking Spaces	Design Hour Demand	Parking Space Demand	Parking Space Requirement
1999	28	10	18	10 (surplus)
2005	28	10	18	10 (surplus)
2010	28	12	22	6 (surplus)
2020	28	14	25	3 (surplus)

Source: Stantec Consulting Inc.

The parking area in front of the general aviation corporate apron is reserved for tenant parking. However, tenants with hangars generally park at their hangars, and consequently, the parking area primarily serves tenants utilizing aircraft tiedown space. Therefore, only tiedown space demand was used in calculating the requirement for auto parking space.

The current 28 parking spaces located in front of the general aviation corporate apron is adequate to accommodate tenants with tiedown space. The projected demand for tiedown space ranges from seven to twelve tiedown spaces, which is less than the number of existing auto parking spaces. Since the tenants only park at the parking area when they are flying or working on their airplanes, the actual design hour demand is even lower. However, consideration should be given to hangar availability as described in the tiedown space requirement as to the possibility of hangars not being available. Thus, generating additional tiedown and associated auto parking space demand.

GROUND ACCESS

Access to Nogales International Airport is available from State Route 82 from the northeast and southwest. It is a two-lane rural highway connecting the Airport to the Cities of Nogales and Patagonia. An airport bypass to Interstate Highway 19 has also been proposed in association with the CANAMEX Corridor Coalition. The coalition is responsible for developing the north-south trade corridor that extends from Mexico to Canada. Accessibility to the airport from Tucson and other northern cities would be enhanced with the bypass.

On-airport access is provided by a two-lane roadway, which enters the airport property directly from State Route 82 at midfield, across from the tiedown apron. It extends north providing access to the new and old terminal areas. With proper maintenance and lighting, the existing airport access road should be adequate for the planning period. However, consideration of new or additional airport access roadways, such as a perimeter road, is inherent with any new airport development and should be considered as part of the planning process.

SIGNAGE

Additional directional signage from the community to the airport is needed. The airport has contacted ADOT for assistance.

4.2.3 Hangars

The same assumptions that went into identifying the aircraft tiedown space demand are applied when calculating the hangar requirements. Other than the FBO and the Border Patrol/U.S. Customs hangars, which accommodate multiple airplanes, it is assumed each hangar will house only one aircraft. The based aircraft forecast translates to a requirement of 30 additional hangars by the end of the planning period (**Table 4-14**). Meanwhile, the airport will need 11 and 16 additional hangars in 2005 and 2010, respectively.

TABLE 4-14 HANGAR REQUIREMENT

Year	Existing Hangars	Hangar Demand[1]	Hangar Requirement*
1999	21	21	0
2005	21	32	11
2010	21	37	16
2020	21	51	30

[1]Hangar demand factors multiple aircraft storage by the FBO and Border Patrol/US Customs hangars.
Source: Stantec Consulting Inc.

4.2.4 Fixed Based Operator

Tiffin Aviation is the only FBO currently located at Nogales International Airport. It operates and maintains the Airport for the County. FBO requirements are generally tenant-driven. However, Tiffin Aviation operates from the terminal building and its demand is factored into the terminal facility requirements.

4.2.5 Fuel Storage

The airport currently has two 12,500-gallon fuel tanks – one for Jet A and one for AvGas (100LL). The airport has not had any difficulty in the past with timely fuel deliveries to the airport, but the tanks have been close to empty on some weekends. Based on the projected increase in aircraft operations over the planning period, the airport will have to increase the frequency of fuel deliveries. The airport currently sells over 238,000 total gallons of which the majority is Jet A. Based on the existing operations, approximately 15 or more Jet A and eight or more AvGas fuel deliveries are needed annually to maintain proper fuel reserves. It is estimated that by 2020, Jet A fuel deliveries will be required at least twice per month and AvGas deliveries will be required at least once per month. An alternative to increasing fuel deliveries is to expand the fuel farm to accommodate additional Jet A and AvGas fuel storage.

4.2.6 Airport Rescue and Firefighting Facility (ARFF)

As inventoried in the Master Plan Update, Nogales Suburban Fire District provides general service and firefighting support to Nogales International Airport. Based on the type of operations at Nogales International Airport, an ARFF on the airport is not required. In the

unlikely event an airport rescue or firefighting emergency occurs, the fire district would be better prepared if special equipment for aircraft were added to its inventory.

4.2.7 Utilities

Utilities at the airport include water, wastewater, electrical, and telephone. The newly installed waterline from the Nogales pumping plant and sewer plant will accommodate the Airport needs for water and wastewater service through the planning period. The electrical system currently provides adequate service to the airport users. Safety will also be improved when the overhead electrical lines are placed underground as identified in the Airport's electrical program. However, electrical needs inherent with new airport development may warrant improvements to the existing system. Currently, only the terminal and FBO hangar are tied into the telephone system. The buried telephone lines may have been adversely impacted with the water and wastewater construction, affecting telephone service to other airport facilities. Therefore, telephone service should be made available to the impacted area and other facilities on the airport.

4.2.8 Joint Customs Facility (U.S. and Mexico)

The objective to develop a joint customs facility between U.S. and Mexico was identified by the Planning Advisory Committee (PAC) to support the goal of economic development and expansion at the airport. Preliminary research has indicated that such facilities are rare (with possible exceptions being Florida and along the Canadian border). U.S. Customs concerns lie with the sensitivity, compatibility, safety, and liability associated with customs facilities. Further analysis and discussion with appropriate agencies combined with the September 11, 2001 events, indicates that there is little possibility that this joint customs facility will ever be realized.

4.2.9 Security

As a result of recent events, the importance of airport security has increased. Although specific guidance has not been published regarding increased security measures, there are actions the airport can take now to enhance security. Additional security measures should include fencing around the terminal area as well as the apron and hangar areas. The airport currently has perimeter fencing, but this fencing should be upgraded. Further, consideration should be given to installing additional security lighting.

4.2.10 Property Acquisition

The airport is currently pursuing the acquisition of three parcels on the east side of the airport. These three parcels were mistakenly identified as airport property in the past and so airport perimeter fencing actually includes these three parcels. Although location and terrain limits the full use of these parcels, their acquisition will increase the airport's long-term development opportunities. The runway protection zone (RPZ) on Runway 3 end is not fully owned or controlled by the airport. It is recommended that an avigation easement be acquired to control the remainder of this RPZ. It is should be noted that an adjacent land owner has an easement through the RPZ to access their private property. Based on its

location combined with the proposed master plan development, this easement should be vacated and a new roadway location designated. This is further addressed in the alternatives chapter.

4.2.11 Airport Maintenance

The FBO and County have accomplished airport maintenance using existing equipment and facilities. However, the airport has identified the need for a sweeper. While no place currently exists for an airport maintenance building, an area should be reserved if the airport chooses to consolidate the storage of maintenance equipment.

4.3 FACILITY REQUIREMENTS SUMMARY

Table 4-15 presents a summary of the facility requirements. The next step in the master planning process involves evaluating development alternatives of these requirements and selecting a preferred alternative for airport development.

TABLE 4-15 SUMMARY OF FACILITY REQUIREMENTS

Elements	Requirements
Airside	
Runway	
• Width	Widen the runway so that the entire runway is 100 feet wide.
• Safety Area	Provide the proper grading off Runway 3 to ensure safety area meets FAA design standards. Increase Runway 21 safety area dimensions from B-II to C-II standards.
• Holdline Positions	Relocate holdline position marking 250 feet from runway centerline.
Taxiways	Consider widening certain taxiways to support airplane design group IV aircraft operating at the airport, and upgrade taxiway reflectors to MIRLs.
Cargo Staging Apron	Provide an additional 20,000 SF cargo staging area.
Airfield Pavement	Continue with pavement maintenance program.
Airfield Navaids/Visual Aids	Replace SAVASI with more current technology.
Lighting/Signage	No additional development required.
Air Traffic Control Tower	Not required.
Landside	
Terminal	Expand existing terminal facility by an additional 1,514 SF.
Ground Access	Consider new or additional airport access roadways, such as a perimeter road, with airport development. Additional directional signage from the community to the airport is needed.
Hangars	Construct 11 additional hangars by 2005, 16 in 2010, and 30 by the end of the planning period.
FBO	See terminal facility
Fuel Storage	Increase frequency of fuel deliveries or expand fuel farm
ARFF	No additional development required.
Utilities	Make telephone service available to other facilities located at the airport. Other utility improvements should coincident with airport development, as appropriate.
Security	Consider security enhancements such as upgraded perimeter fencing, installation of terminal/apron area fencing, and installation of additional security lighting
Maintenance Building	Identify location of future building should the County decide to consolidate maintenance activities
Property Acquisition	Acquire property in fee simple and avigation easements as needed to accommodate long-term development and runway protection zones.

Source: Stantec Consulting Inc.